

THE DISTRIBUTION AND HABITAT REQUIREMENTS OF THE TIGER BEETLE *CICINDELA GERMANICA* LINNAEUS (COLEOPTERA: CARABIDAE) IN SOUTHERN BRITAIN

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INTRODUCTION

Tiger beetles are voracious predators which are characterized, in part, by their very agile habits (a fast gait and a readiness to fly) and their preference for dry, usually sandy, habitat. Most species are particularly active in hot, sunny conditions. Of the five British species, four closely conform to these characteristics, the exception being *Cicindela germanica* Linnaeus. Although this species has fully developed hind wings, it is apparently incapable of flight (I have never seen one fly nor have I heard of it doing so). When alarmed the beetle seems to rely entirely on running with great speed towards the nearest available corner (commonly fissures in the soil or clumps of ground vegetation). In addition, in Britain at least, it is usually associated with damp coastal habitat.

DISTRIBUTION

In the British Isles this beetle is a rare and very local species, confined almost entirely to the coasts of south Isle of Wight, west Dorset and, at least formerly, Hampshire, south-east Devon and Dyfed. In addition there are old, unconfirmed, records for Berkshire, Kent and north-east Scotland. Since 1970 there have been records from two sites (three if Totland is included—see below) in the Isle of Wight and about four in Dorset. It has been categorized as a nationally rare species by Shirt (1987) and Hyman (1992). Confirmed records of this species have been published as a distribution map by Luff (1982); an updated provisional atlas of the British Carabidae is currently in preparation.

This species is very widely distributed throughout much of the Palaearctic, from Britain to eastern China; it is absent from both the far north of Europe and Asia (Horion, 1941). Throughout this range it is a local beetle, and in some localities is declining.

British records are summarized below. The following abbreviations have been used: BRC—record held by The Biological Records Centre, Monks Wood, Huntingdon; NHML—The Natural History Museum, London.

Berkshire. Basildon, near Pangbourne, Rev. C. S. Bird (Curtis, 1824).

Devon. Axmouth—Lyme Regis NNR, one, 6.viii.1968, M. G. Morris. Colyton, one, 28.vii.1944, G. H. Ashe (M. G. Morris coll.) (Colyton is well inland and is where Ashe lived in retirement; it is thus very likely that this specimen was collected somewhere nearby on the coast). Seaton, one, vi.1895 (Garde, 1906; Keys, 1918); landslip in some numbers, 20.viii.1944 (annotation in G. H. Ashe's copy of Fowler (1887), J. Cooter, pers. comm.); three, 17.vi.1947, A. A. Allen & G. H. Ashe; vii.1950, G. H. Ashe (BRC); landslip, 1961, P. J. M. Greenslade (BRC). The county (but no localities) is also listed by Fowler (1887) and Lindroth (1974).

Dorset. Bridport, 1897, H. Britten (BRC); one, 18.vii.1897, B. D. Cooke (D. G. Hemingway coll.); one, vii.1946, A. M. Masee (M. G. Morris coll.) (Bridport is inland, thus records attributed to this locality probably refer to Eype's Mouth or a coastal site close by). Charmouth, Dawson (1854); Pearce (1926); one, 13.vi.1928, C. E. Tottenham (NHML); 'large colony on a fairly level and moist clearing [on

blue clay] in the scrub on the top of the cliff some three-quarters of a mile east of the point where the lane from the village comes down to the shore", 20.vi.1936 (Daltry, 1949); one, 17.vii.1952, J. Cowley (NHML). Charmouth–Lyme Regis landslip, small numbers at one restricted site at the eastern end of The Spittles (adjacent to and above the beach) almost annually between 1981 and at least 1986, G. R. Else. Chideock (probably Seatown), 30.vii.1989, A. Duff (BRC). Seatown, near Chideock, one, 3.vii.1981 and another on 6.vii.1991, both G. R. Else; in abundance on sun-baked, exposed soil high up on an unstable cliff a short way to the east of Seatown, viii.1992, D. G. Hemingway. Eype, 24.vii.1980, P. Hodge (BRC); 4.vi.1989, D. A. Lott (BRC). Eype's Mouth, numerous larvae, 30.ix.1964, M. Luff (pers. comm.); vii.1969, R. Crossley (BRC); 3.vi.1989, M. Collier & H. Mendel (BRC); adults, many larvae and a pupa, 1.vi.1992, J. A. Owen (pers. comm.). Near Great Ebb, Thorncombe Beacon (c 1 km west of Eype's Mouth), three on damp, broken undercliff, 1.viii.1992, S. P. M. Roberts; the species has also been found here recently on several occasions by J. Cooter. Golden Cap–St. Gabriel's Mouth area (cliff terrace), a few, 17.vi.1992, J. Cooter. Lyme Regis, ix.1833, F. Walker (Walker, 1833), and one, 2.viii.1951, D. Tozer (NHML); 1957, D. Tozer (BRC). Swanage, Dawson (1854 [as Swanwich]); 1894, E. C. Rye (BRC); one labelled "Swanage. E.A.W." (presumably Waterhouse) (H. W. Ellis collection in The Yorkshire Museum, York (M. L. Denton, pers. comm.)) E. A. Waterhouse (in Fowler & Donisthorpe, 1913).

Dyfed. Llanstephen, one, 2.viii.1954, B. Sage (Sage, 1955) (the specimen survives in Sage's collection (identification confirmed)). This locality is a coastal site which, according to I. Morgan (pers. comm.), consists of south-facing Old Red Sandstone cliffs with some freshwater seepages.

Grampian. Inverey, near Braemar, two running amongst stones by the Dee, apparently in v.1953, A. M. Robertson (Robertson, 1954). This unconfirmed and very dubious record may have been based on misidentified *Cicindela campestris* Linnaeus or perhaps either *Asaphidion pallipes* (Duftschmid) or an *Elaphrus* species.

Hampshire. Barton-on-Sea, "rare", 1928 and 1930, A. Ford (B. M. Hobby in Fraser, 1949); four, 24.vi.1948, "HWF" (A. Sculthorpe collection, NHML). Five, 20.vi and 30.vi.1948, Fraser (1949) at a locality, not specified, opposite the Isle of Wight (he also refers to a Dr Basker who obtained specimens near this locality, but the name of the latter is again not quoted and neither is the date of collection): it is possible that this site refers to Barton-on-Sea.

Isle of Wight. Blackgang and Blackgang Chine, Chale. These two localities are so close to one another that they are treated here as a single site, Blackgang (the Chine is less than 0.5 km from Blackgang itself). Most, if not all, of the many "Blackgang" records probably come from the foot of the Chine. This is one of the best known localities for the species in Britain and one from which it has long been known to occur (e.g. Curtis, 1824; Fowler, 1887). Indeed, Curtis's record (first edition, omitted from the second) of a specimen collected here in vii.1810 by a Mr Brightwell, is apparently the first reference to this species' occurrence in Britain. Other records of the beetle from this site include eight, 5.vii.1894 and four, 13.viii.1903, H. Donisthorpe (NHML); four, 24.viii.1908, H. Dollman (NHML); eight, 19.vi.1928, C. E. Tottenham (NHML); common, 23.vi.1928, P. Harwood (A. A. Allen, pers. comm.); one, 26.ix.1968, M. Chambers and G. R. Else; at least 15, 28.vii.1977, D. M. Appleton and G. R. Else; several, 1.vii.1980, G. R. Else. There are numerous other records from Blackgang which are held by the Biological Records Centre, Monks Wood (M. Telfer, pers. comm.). Chale (this locality is probably synonymous with Chale

Chine (near Blackgang Chine) (the village of Chale being inland)), 16 (no date), G. C. Champion (NHML); one, 7.vii.1917, C. T. Gimingham (M. G. Morris coll.); several larvae in their burrows, K. G. Blair (Blair, 1920). Ladder Chine (adjacent to Whale Chine), 1947, F. D. Buck (BRC). Ryde, Rudd, 1837 (Fowler & Donisthorpe, 1913). Shanklin, one, v.1921, C. E. Stott (M. G. Morris coll.). Totland Bay, probable larvae of this species on the landslip, 8.v.1988 and 15.v.1989, J. A. Owen (pers. comm.). Whale Chine, 16.vi.1990, A. P. Fowles (BRC). Whale Chine east to Ladder Chine (about 2.5 km north-west of Blackgang), one, landslip, 1.vii.1980, G. R. Else; in great abundance in the same area, 28.vi.1990, G. R. Else, J. Ismay and C. O'Toole.

Kent. Dartford (Curtis, 1824). Darenth Wood (Fowler, 1887).

HABITAT PREFERENCES

The five British species of *Cicindela* exhibit strong habitat preferences. *C. maritima* Lat. & Dej. and *C. hybrida* L., which are mainly confined to western Britain, are inhabitants of dry, coastal duneland; *C. sylvatica* L. is particularly associated with sandy, inland heaths in southern England; and *C. campestris* L., which is found throughout the British Isles, is mainly encountered on sandy soils in various biotopes, including heaths, moors, open deciduous woodland and the coast. In contrast, *C. germanica* is usually associated with sparsely vegetated soils in the vicinity of freshwater seepages on coastal landslips (*C. campestris* has also been found in the same habitat as that favoured by *C. germanica* in Dorset, but there it is very scarce).

Lindroth (1974) in his handbook to the British Carabidae describes the habitat of *C. germanica* as "open grassland near the coast". This description is inaccurate and misleading as it could, for example, imply calcareous downland just inland of the coast. On several occasions in the 1970s, D. M. Appleton and I searched for the species in grassy scrubland on the higher terraces of the Blackgang landslip, Isle of Wight, without encountering a specimen. Newbery (in Morey, 1909) is more accurate when he states "foot of cliffs amongst coarse grass". All Blackgang specimens found by D. M. Appleton and me were eventually found running over freshwater seepages, consisting of areas of wet mud on the lowest cliff terrace or at the base of the cliffs. Typically, sparse vegetation predominated in these sites, often with quantities of reed (*Phragmites australis* (Cav.)). In all other sites in which I have found the beetle on the Isle of Wight and in Dorset the habitat also consisted of freshwater flushes near the bases of cliffs or on steep slopes. Some of these sites were extremely limited in extent. For example, on the Charmouth-Lyme Regis landslip, Dorset, I found the species on an expanse of open, wet clay adjacent to a small reedbed. Similar habitat existed elsewhere on the landslip but the beetle was never observed there, despite several searches. At Chideock, my 1991 specimen was found in another very discrete area: a wet, muddy slope near the cliff edge. The slope was surrounded on the inland side by dense scrub. At Seaton, Devon, A. A. Allen (pers. comm.) found the beetles on the lower part of the landslip, where they ran on sandy silt beside a small stream or seepage. However, on the Hampshire coast, Fraser (1949) found his specimens in very dry, gravelly situations; some other records refer to the species occurring on sun-baked soils. The gradual, continual slumping of the interbedded clays, sandstones and limestones of the landslips which are such a feature of the species' preferred biotope in Dorset and on the Isle of Wight, is responsible for maintaining a constant supply of exposed, often waterlogged, soil. Such areas may eventually dry out, become overgrown with vegetation, and hence lose their attraction to the beetle.

On the European mainland this species is not dependent on any special habitat requirements; for example, it occurs on the coast, heaths, natural grassland (steppes), chalk, and along moist woodland edges (Koch, 1989).

BIOLOGICAL OBSERVATIONS

Very little seems to be known about the biology of this species. The predatory larvae of *C. germanica* have been located in Britain, at Blackgang, Isle of Wight, in early May, 1920 (Blair 1920) and at Eype's Mouth, Dorset (larval burrows found plentifully in damp sand or mud by M. Luff and J. A. Owen (pers. comm.) and, although larvae were collected by both, none were reared). On 1.vi.1992 Owen found as many as 20 larval burrows to the square metre in places. Donisthorpe (1906) states that on the Isle of Wight the larval burrows are covered completely by the sea when the tide is very high. This is probably exceptional, as in many sites I have visited (both on the Island and elsewhere) the species occurs on ground well above the high water mark. The fully grown larva is briefly described by Blair (1920). The adults are active from mid-May to September; callow specimens have been unearthed in early May (J. Cooter, pers. comm.). Prey capture by larvae or adults has rarely, if ever, been witnessed (according to Blair (1920), the larvae that he found had fed mainly on ants).

I have collected specimens of the very local tiphiid wasp *Methocha ichneumonoides* Latr. in the same habitat as that for *C. germanica* in the Isle of Wight and Dorset. The apterous female of this wasp seeks out (as food for its offspring) *Cicindela* larvae of several species which it paralyzes, by stinging, in their burrows. For further details of its biology see Champion & Champion (1914). In these coastal sites the wasp is appreciably smaller than most specimens found in areas inhabited by the other, larger *Cicindela* species. It is therefore possible that *C. germanica* is the main host of this wasp when the latter is found in this beetle's few coastal localities.

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BOOK REVIEW

Biology of insect-induced galls edited by J. D. Shorthouse and O. Rohfritsch. Oxford University Press, New York & Oxford, 1992, ISBN 0-19-506716-9, x + 285 pages, hardback, £65.—This wide-ranging and stimulating volume brings together contributions from many of the leading researchers in the field of cecidology. The editors have allowed different approaches from their authors, according to the topics concerned, and in the opinion of the reviewer this makes for a much more lively and interesting book than a series of literature reviews with a similar structure and style. There is insufficient space here to discuss (or even list!) the contents of each of the 17 chapters. Suffice it to say that many aspects of insect-induced galls are considered in depth and with the results of some of the latest investigations included and placed in context. With such a broad subject, individual readers will find different chapters of greater or lesser interest, but any entomologist or cecidologist will find much to inspire as well as many sections to refer to in future. I particularly enjoyed chapter 3 'Evolution of the gall-inducing guild', chapter 4 'Fossil galls', chapter 14 'Evolution and ecology of gall-inducing sawflies' and chapter 15 'Ecology of *Pemphigus* gall aphids', but I found a great deal of interest in the other chapters as well. Gall-inducing insects are fascinating to study, for both professional biologists and amateur naturalists, offering many opportunities for original investigations. For instance, the life-histories and natural enemies of many gall-inducing insects remain unknown, and with the growth of the British Plant Gall Society it is now easier to contact others with similar interests. This is an expensive book, but if you are interested in the subject it is strongly recommended as being good value and the best treatment of its kind available. The forthcoming volume on plant galls in the Naturalists' Handbooks series (to be reviewed in this Journal) will be much cheaper and directed more towards the amateur naturalist in Britain; those with restricted budgets for book purchases might wish to wait for this latter book to appear.